

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

## PCT

To:

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### NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Rule 71.1)

Date of mailing  
(day/month/year)

13.04.2004

Applicant's or agent's file reference  
WO5269-Aa/rp

### IMPORTANT NOTIFICATION

International application No.  
PCT/NL 03/00030

International filing date (day/month/year)  
17.01.2003

Priority date (day/month/year)  
17.01.2002

Applicant  
MASSEE, Johan

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.
4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed inventions is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

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preliminary examining authority:



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PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT  
(PCT Article 36 and Rule 70)

REC'D 14 APR 2004



WIPO PCT

Applicant's or agent's file reference WO5269-Aa/rp	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/4-16)	
International application No. PCT/NL 03/00030	International filing date (day/month/year) 17.01.2003	Priority date (day/month/year) 17.01.2002
International Patent Classification (IPC) or both national classification and IPC B21D22/14		
Applicant MASSEE, Johan		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 5 sheets, including this cover sheet.
  - ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 8 sheets.

3. This report contains indications relating to the following items:
  - I ☒ Basis of the opinion
  - II ☐ Priority
  - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
  - IV ☐ Lack of unity of invention
  - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
  - VI ☐ Certain documents cited
  - VII ☐ Certain defects in the international application
  - VIII ☐ Certain observations on the international application

Date of submission of the demand  11.08.2003	Date of completion of this report  13.04.2004
Name and mailing address of the international preliminary examining authority:   European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer  Rechler, W  Telephone No. +49 89 2399-2354 

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/NL 03/00030

**I. Basis of the report**

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

**Description, Pages**

4-13 as originally filed  
1-3 received on 24.02.2004 with letter of 23.02.2004

**Claims, Numbers**

1-22 received on 24.02.2004 with letter of 23.02.2004

**Drawings, Sheets**

1/9-9/9 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:
- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.
4. The amendments have resulted in the cancellation of:
- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. **PCT/NL 03/00030**

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5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Yes: Claims	2 - 15, 17 - 22
	No: Claims	1, 16
Inventive step (IS)	Yes: Claims	4, 18
	No: Claims	1 - 3, 5 - 17, 19 - 22
Industrial applicability (IA)	Yes: Claims	1 - 22
	No: Claims	

**2. Citations and explanations**

**see separate sheet**

**Re Item V:**

1. Reference is made to the following documents:

D1: DE-A-23 27 664  
D2: DE-A-19 64 401  
D3: JP-A-59-193724  
D4: JP-A-2000301246  
D5: EP-A-0 916 426

2. The present application does not meet the requirements of the PCT, because the subject matter of claims 1 and 16 is not new in the sense of Article 33 (2) PCT.

Document D1 discloses a method with all features of claim 1 in combination as well as an apparatus with all features of claim 16. In particular D1 discloses two or three tools arranged one after the other and all are deforming the workpiece. D1 also discloses (see figures 9 and 10) several tools mounted on a common holder being rotatable about an axis which crosses the axis of rotation and/or being radially adjustable.

3. The present application does not meet the requirements of the PCT, because the subject matter of claims 2 and 17 does not involve an inventive step in the sense of Article 33 (3) PCT.

The subject matter of claims 2 and 17 differs from the disclosure of document D1 only in that "at least one of the tools is positioned eccentrically with respect to the axis of rotation". This feature, however, is already known from document D5 as providing the same advantages as in the present application. The skilled person would therefore regard it as a normal option to include this feature in the method and apparatus described in document D1 in order to solve the problem posed.

4. The subject matter of claims 4 and 18 is distinguished from the disclosure of document D1 by the feature that the tools are moved (or capable of movement) relative to each other during working. This feature is not known from or fairly suggested by any of the available prior art documents.
5. The subject matter of claim 5 is distinguished from the disclosure of document D1 by the feature that no mandrel being present in the part that is being deformed. This,

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/NL03/00030

however, is already known from document D5. Thus a combination of the teachings given by documents D1 and D5 leads without the need of inventive activity to the subject matter of claim 5.

3. Dependent claims 3, 6 - 15 and 19 - 22 (as far as they do not depend on claim 4 or 18) do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of inventive step, because they merely describe slight constructional changes in the devices of claims 16 - 18 or slight variations in the methods of claim 1, 2, 4 or 5 which come within the scope of the customary practice followed by persons skilled in the art, especially as the advantages thus achieved can readily be foreseen. Consequently, the subject matter of claims 3, 6 - 15 and 19 - 22 lacks an inventive step.

**Further Remarks:**

1. Although claims 1, 2, 4, 5 and 16 - 18 have been drafted as separate independent claims, they appear to relate effectively to the same subject matter and to differ from each other only with regard to the definition of the subject matter for which protection is sought and/or in respect of the terminology used for the features of that subject matter. The aforementioned claims therefore lack conciseness. Moreover, lack of clarity of the claims as a whole arises, since the plurality of independent claims makes it difficult, if not impossible, to determine the matter for which protection is sought, and places an undue burden on others seeking to establish the extent of the protection.

Hence, claims 1, 2, 4, 5 and 16 - 18 do not meet the requirements of Article 6 PCT.

2. The description is not in conformity with the claims as required by Rule 5.1(a)(iii) PCT.
3. According to the requirements of Rule 11.13(m) PCT the same feature shall be denoted by the same reference sign throughout the application. This requirement is not met in view of the use of "3B" in claims 6 and 19.

24. 02. 2004

W05269-Aa/aa

(67)

Method and forming machine for manufacturing a product having various diameters

The invention relates to a method and a forming machine suitable for manufacturing a product having various diameters from a workpiece, such as a metal cylinder or plate, in which the workpiece is clamped down in a clamping device, 5 the workpiece and a first tool are rotated about an axis of rotation relative to each other, the workpiece is deformed by means of said first tool by placing the tool into contact with the workpiece and moving the workpiece and/or the tool in a direction along, i.e. parallel to or having a component 10 parallel to, the axis of rotation.

Such a method and apparatus are known, e.g. from EP 0 916 426. Said publication describes how one end of a cylindrical workpiece is worked by clamping down said workpiece in a clamping device (indicated by numeral 12 in Fig. 1 of EP 0 15 916 426) and deforming said ends by means of three forming rollers (28), which are mounted on a rotary member (24). Said forming rollers (28) rotate in the same plane and are pressed against the workpiece at three locations which are evenly distributed over the circumference of the workpiece, after 20 which said rollers move along a number of paths along the workpiece so as to deform the workpiece in steps.

For the sake of completeness, attention is drawn to DE 23 27 664 and DE 1964 401, in which methods and apparatuses are described for flow pressing cylindrical tubes, i.e. 25 tubes having a constant diameter. The methods and apparatuses according to these documents are unsuitable for manufacturing a product having various diameters. JP 2000301246 also relates to a method and apparatus for flow pressing cylindrical tubes.

30 The object of the invention is to provide an improved method and forming machine.

In order to accomplish that objective, the method and the forming machine referred to in the first paragraph are characterized in accordance with the independent claims.

Preferably, the tools each comprise two or more  
5 forming rollers, between which the workpiece is retained while being worked and which occupy substantially the same axial position with respect to the workpiece. It is possible to impose relatively large as well as relatively small diameter changes by means of forming rollers. Such rollers are  
10 preferably freely rotatable about an axis, which extends either horizontally or at an angle with respect to the aforesaid axis of rotation. Furthermore, it is preferred that most or all of the tools form part of one and the same deforming head, or that they are at any rate positioned relatively  
15 close together. The question as to the most suitable spacing between successive tools, at least between the positions at which the tools make contact with the workpiece, depends on the properties of the workpiece, of course, and on the nature of the working process to be carried out. In many cases said  
20 spacing will vary between 1 and 30 cm.

If the material and the dimensions of the workpiece and the intended product (frequently a semifinished product) allow so, the number of working cycles can be reduced to one, if desired. A surface that has been worked once will not be  
25 worked anew in that case, so that the load to which the material is subjected will remain limited. In addition to that the programming of any control equipment that may be provided will be significantly simpler, in particular because it will not be necessary to take the shape and the behaviour of various  
30 intermediate forms into account.

For the sake of completeness it is noted that British patent application No. 238,960 describes a roller by means of which the diameter of bars, pipes and the like is reduced to a smaller, uniform diameter in a continuous process, using a number of tools arranged in succession.  
35

Further, attention is drawn to US 5,428,980, in which a workpiece is deformed with a first forming roller and



glazed with a second roller. A second forming roller is not described.

JP 59 193724 relates to a device wherein plural rollers having different shapes have been attached to a tool rest. The rollers are disposed "in a way as not interfere with the respective parts of the device and a blank material during working".

The invention will be explained hereinafter with reference to the figures, which show a number of embodiments of the method and the forming machine according to the present invention.

Figs. 1A and 1B schematically show the deformation of one end of a cylindrical workpiece by means of five tools.

Figs. 2A and 2B show the eccentric deformation of one end of a workpiece by means of three tools.

Figs. 3A - 3C show the fixing of an insert member in a cylindrical workpiece, using a method comparable to the method as used in Figs. 2A and 2B.

Fig. 4 is a cross-sectional view of a forming machine for eccentric deformation of a workpiece, which machine comprises four tools.

Figs. 5A and 5B are front views of a workpiece which has been subjected to one operation and two operations, respectively, by means of the forming machine of Fig. 4.

Fig. 6 is a top plan view of a forming machine which is in particular suitable for deforming relatively long workpieces.

Figs. 7 and 8 are a front view and a perspective view, respectively, of a so-called carriage for use in a forming machine as shown in Fig. 6.

Figs. 9A and 9B are schematic sectional views of the carriage of Figs. 6 - 8.

Fig. 10 shows the flow forming process carried out by using the present invention.

Fig. 11 shows the so-called bottom-closing process carried out by using the present invention.

## CLAIMS

(67)

1. Method of manufacturing a product having various diameters from a workpiece (1), such as a metal cylinder or plate, in which the workpiece (1) is clamped down in a clamping device (10, 34), the workpiece (1) and a first tool (3A) are  
5 rotated about an axis of rotation (2) relative to each other, the workpiece (1) is deformed by means of said first tool (3A) by placing the tool (3A) into contact with the workpiece (1) and moving the workpiece (1) and/or the tool (3A) in a direction along said axis of rotation (2), **characterised in that** at  
10 least a second tool (3B) is placed into contact with the workpiece (1) at a position behind the first tool (3A), the workpiece (1) is also deformed by means of said second tool (3B) and wherein two or more forming rollers associated with different tools (3) are mounted on a common holder (38) and said  
15 holder (38) is rotated about an axis (39) which crosses said axis of rotation (2) and/or radially adjusted.

2. Method of manufacturing a product having various diameters from a metal cylinder (1), in which the cylinder (1) is clamped down in a clamping device (10, 34), the cylinder (1)  
20 and a first tool (3A) are rotated about an axis of rotation (2) relative to each other, the cylinder (1) is deformed by means of said first tool (3A) by placing the tool (3A) into contact with the workpiece (1) and moving the cylinder (1) and/or the tool (3A) in a direction along said axis of rotation (2), **characterised in that** at least a second tool (3B) is placed into  
25 contact with the cylinder (1) at a position behind the first tool (3A), the cylinder (1) is also deformed by means of said second tool (3B) and at least one of the tools is positioned eccentrically with respect to the said axis of rotation (2).

30 3. Method according to claim 2, wherein an insert (11B) is placed inside the cylinder and the end of the cylinder (1) is pressed onto the end of the insert member (11B).

4. Method of manufacturing a product having various diameters from a workpiece (1), such as a metal cylinder or  
35 plate, in which the workpiece (1) is clamped down in a clamping device (10, 34), the workpiece (1) and a first tool (3A) are

rotated about an axis of rotation (2) relative to each other, the workpiece (1) is deformed by means of said first tool (3A) by placing the tool (3A) into contact with the workpiece (1) and moving the workpiece (1) and/or the tool (3A) in a direction along said axis of rotation (2), **characterised in that** at least a second tool (3B) is placed into contact with the workpiece (1) at a position behind the first tool (3A), the workpiece (1) is also deformed by means of said second tool (3B) and wherein the tools (3) are moved relative to each other during said working.

5. Method of manufacturing a product having various diameters from a metal cylinder (1) and without, during at least the greater part of the manufacturing, a mandrel being present in the part that is being deformed, in which the cylinder (1) is clamped down in a clamping device (10, 34), the cylinder (1) and a first tool (3A) are rotated about an axis of rotation (2) relative to each other, the cylinder (1) is deformed by means of said first tool (3A) by placing the tool (3A) into contact with the cylinder (1) and moving the cylinder (1) and/or the tool (3A) in a direction along said axis of rotation (2), **characterised in that** at least a second tool (3B) is placed into contact with the cylinder (1) at a position behind the first tool (3A), the cylinder (1) is also deformed by means of said second tool (3B).

6. Method according to any one of the preceding claims, wherein at least a third tool (3B) is placed into contact with the workpiece (1) at a position behind the second tool (3B).

7. Method according to any one of the preceding claims, wherein the tools (3) each comprise two or more forming rollers, between which the workpiece (1) is retained while being worked.

8. Method according to any one of the preceding claims, wherein the workpiece (1) is formed into a finished or semifinished product in only one working cycle.

9. Method according to any one of the preceding claims, wherein a tensile force is exerted on the workpiece (1).

10. Method according to claim 9, wherein said tensile force is varied during said working.

11. Method according to any one of the preceding claims, wherein at least one of the tools is adjusted in radial  
5 direction during said working.

12. Method according to any one of the preceding claims, wherein the workpiece (1) has an open end, which end is closed by means of the tools (3), preferably in one operation.

13. Method according to any one of the preceding  
10 claims except claim 5, wherein the workpiece (1) is a plate-shaped body, and wherein the central axis of the tools is pivoted relative to the axis of rotation (2).

14. Method according to claim 13, wherein the tools (3) are moved relative to each other during said working.

15 15. Method according to claim 13 or 14, wherein the edge of the workpiece (1) is supported at least during part of the operation.

16. Forming machine suitable for manufacturing products having various diameters, which forming machine comprises  
20 at least a clamping device (10, 34) for clamping down a workpiece (1), such as a metal cylinder or plate, a first tool (3A), which can be placed into contact with the workpiece (1) while being worked, means for rotating the workpiece (1) and the tool (3A) about an axis of rotation (2) relative to each  
25 other, and means for moving the workpiece (1) and/or the tool (3A) in a direction along said axis of rotation (2), **characterized in that** the forming machine furthermore comprises at least a second tool (3B) disposed behind said first tool (3A), which can be placed into contact with the workpiece (1) and wherein  
30 two or more forming rollers associated with different tools (3) are mounted on a common holder (38) and said holder (38) is mounted in or on the forming machine in such manner as to be capable of rotation about an axis (39) which crosses said axis of rotation (2) and/or of radial translation.

35 17. Forming machine suitable for manufacturing products having various diameters, which forming machine comprises at least a clamping device (10, 34) for clamping down a workpiece (1), such as a metal cylinder or plate, a first tool

(3A), which can be placed into contact with the workpiece (1) while being worked, means for rotating the workpiece (1) and the tool (3A) about an axis of rotation (2) relative to each other, and means for moving the workpiece (1) and/or the tool (3A) in a direction along said axis of rotation (2), **characterized in that** the forming machine furthermore comprises at least a second tool (3B) disposed behind said first tool (3A), which can be placed into contact with the workpiece (1), and at least one of the tools is positioned eccentrically with respect to the said axis of rotation (2).

18. Forming machine suitable for manufacturing products having various diameters, which forming machine comprises at least a clamping device (10, 34) for clamping down a workpiece (1), such as a metal cylinder or plate, a first tool (3A), which can be placed into contact with the workpiece (1) while being worked, means for rotating the workpiece (1) and the tool (3A) about an axis of rotation (2) relative to each other, and means for moving the workpiece (1) and/or the tool (3A) in a direction along said axis of rotation (2), **characterized in that** the forming machine furthermore comprises at least a second tool (3B) disposed behind said first tool (3A), which can be placed into contact with the workpiece (1), and in that the tools (3) are mounted in or on the forming machine in such manner as to be capable of movement relative to each other during said working.

19. Forming machine according to any one of the claims 16-18, comprising at least a third tool (3C) disposed behind said second tool (3B).

20. Forming machine according to any one of the claims 16 - 19, wherein the tools (3) each comprise two or more forming rollers, between which the workpiece (1) can be retained.

21. Forming machine according to any one of the claims 16 - 20, wherein the tools (3) can be moved relative to each other during the working.

22. Forming machine according to any one of the claims 16 - 21, comprising a mandrel (5) or bush to be placed in or around, respectively, an unworked part of the workpiece (1),

and by means of which a tensile force can be exerted on the workpiece.